Journal of the Society of Arts.

FRIDAY, NOVEMBER 1, 1861.

INTERNATIONAL EXHIBITION OF 1862.

The Council beg to announce that the Guarantee Deed is now lying at the Society's House for signature, and they will be much obliged if those gentlemen who have given in their names as Guarantors, will make it convenient to call there and attach their signatures to the Document. Signatures for sums amounting in the aggregate to £435,500, have been attached to the Deed.

WEEKLY PROGRESS OF THE INTERNATIONAL EXHIBITION.

This week the great point of interest at the works has been the eastern dome, of which the framework is now beginning to make some show on the outside of the scaffolding. The main columns which support the roof of the domes are constructed in four lengths, three 25 feet and one 20 feet long. As the whole column ascends externally without a break, it is necessary to bolt the lengths to one another on the inside. This operation is one of great difficulty and some danger, as, in order to complete it, a man has to be let down the iron tube, of scarcely 2 feet in diameter, and suspended from above while he inserts the screws. One of the windows on the north-western side of the dome, immediately above the galleries, is in its place, and another is ready to be raised.

The roof of the nave is finished to all but three bays of its entire length, and the glaziers are at work on the clerestory windows. The western dome-scaffold also is completed.

Materials are raised to the different elevations of the building by an ingeniously constructed steam hoist, which, by means of a series of signals made by coloured flags, is completely under the control of the workmen. Another machine on the ground, which is well worthy of inspection when at work, is the hydraulic ram with which all the girders are tested before they are put in the places destined for them. Of these the larger have been tested up to 38 tons, and the smaller to 20.

The fifty feet girders which span the south-western court, and bear its roof, are in course of being erected, and very shortly the whole of the court will be ready for the glaziers. This roof will be like the one of the Exhibition building of 1851, a series of ridges glazed all over.

The bricklayers are at work on the grand staircase, immediately inside the southern entrance, and the work for the refreshment galleries has been laid out and will commence forthwith.

A new feature of the works are the photographic cameras, which are to be found in all parts of the ground. The building, as it progresses, is being photographed from every point of view, and the results may be seen in the illustrated papers. The contract for photographing the works while in progress has been leased by Her Majesty's Commissioners to Messrs. Birnstingl, of Coleman-street, who again employ Messrs. Cundall and Downes, of Bond-street, as their photographers.

The applications for space from British exhibitors are now in course of being classified and methodized, a work of great trouble and difficulty. From the indistinct manner in which many intending exhibitors describe their goods it is sometimes very hard to fix the class to which they belong. After making allowance for duplicate applications, it is understood that the number of applicants in Great Britain and Ireland for space in the industrial classes amounts to about 8,200, and the total space demanded to over a million square feet. As the latter quantity, to suit the necessities of the building, must be reduced to less than one-fifth of its present amount, it is evident that the number of exhibitors will be very far short of that of the applicants. The delicate task of reducing these demands within proper bounds has been entrusted to class or local committees, and it is to be hoped that they will execute their work in such a way as to secure a proper representation of British industries. Many applications may be ruthlessly disposed of at once, as they refer to objects so entirely unsuited for exhibition as to render their rejection a matter of necessity.

It is expected that Her Majesty's Commissioners will take into consideration any appeals which may be made against the decision of committees on the subject of space, but that such appeals must be transmitted through the respective committees, and be heard at the expense of the appellants.

The French Commission has taken a house in Cromwell-road, opposite the main entrance, to be used by them as offices during the continuance of the Exhibition.

The following additional information has been received:—

TUNIS.

The Bey of Tunis has instructed his Prime Minister to provide articles for exhibition, and two commissioners will be appointed to go to London to represent the exhibitors from that country.

NEW ZEALAND.

Her Majesty's Commissioners have received information of the nomination by his Excellency Col. Browne, the Governor of New Zealand, of the following Commissioners, in the several provinces set against their names:—

AUCKLAND.—His Honour the Superintendent, Elwin

Brodie Dickson, Carl Frank Fischer, Charles Heaphy, Edward King, George Patrick Pierce, Robert Patterson, and George Webster.

TARANAKI.—His Honour the Superintendent, Harry Albert Atkinson, and Edward Larwill Humphries.

HAWKE'S BAY.—His Honour the Superintendent, Alexander Kennedy, Joseph Rhodes, John Alexander Smith, and Henry Stokes Tiffen.

WELLINGTON.—His Honour the Superintendent, Richard John Duncan, George Hunter, William Lyon, George Moore, Robert Stokes, William Spink, James Smith, and Jonas Woodward.

NELSON.—His Honour the Superintendent, Jacob Baley, James Lugsdin Bailey, Edward Baigent, Edward Everett, Charles Elliott, and Isaac Mason Hill.

MARLBOROUGH.—His Honour the Superintendent, William Henry Eyes, and William Douglas Hall Baillie.

CANTERBURY.—His Honour the Superintendent, Cyrus Daire, William Donald, Robert Greaves, George Arthur, Emilius Ross, William Wilson, and Augustus Edward White.

OTAGO.—His Honour the Superintendent, Rev. Thomas Burns, D.D., Thomas Bannatyne Gillies, John Hyde Harris, Charles Henry Kettle, William Purdie, and John Matthew.

SOUTHLAND.—His Honour the Superintendent, John Blacklock, James Alexander Robertson Menzies, Thomas John White, and John Topi Patuki, of Stewart's Island.

John Morrison, Esq., of No. 3, Adelaide-place, London-bridge, has been also named as London Commissioner for New Zealand.

THE BRITISH COLONIES AND THE INTERNATIONAL EXHIBITION.

BY P. L. SIMMONDS.

No. VIII.—THE AUSTRALIAN COLONIES.

SOUTH AUSTRALIA.

If it was considered of importance that this colony should be represented at the great Exhibition of 1851; it is generally felt by the colonists that it is of infinitely greater importance that South Australia should be worthily represented in 1862. Since the last Exhibition the progress of the colony has been wonderful; its population has doubled. Instead of 70,000 acres in tillage, there are now 360,000. The pastoral wealth of the colony is treble, and its mineral wealth nearly double, what it was in 1851. There was not a single pound of wool sent to the Exhibition of 1851, but at the present time the colony exports about 10,000,000 lbs. annually; and the production has more than trebled in the ten years. The live stock in the colony in the same period has more than quadrupled, and the value of its exports trebled.

In opening the Session of the Colonial Parliament, on the 26th April, his Excellency the Governor-in-Chief, thus alluded in his speech to the International Exhibition:—

"I shall direct a communication from the Right Hon. the Secretary of State to be laid before you, calling my attention to the Exhibition for All Nations, proposed to be held next year in London; and I am to invite your cordial assistance in providing the necessary means, and promoting the measures best calculated, to enlist the sympathy, and render effective the exertions of this community, to make their contributions on that occasion worthy of the great resources of this province."

In a despatch to His Grace the Duke of Newcastle, Secretary for the Colonies, dated Adelaide, May 23rd, his Excellency Sir R. G. Macdonnell, C.B., also writes:—

"Since the first intimation reached me indirectly of an intention to hold such an Exhibition, I several times brought the matter under the notice of my ministry, being anxious that steps should be taken early to organise and centralise efforts to give effect to what I felt must be the general desire of the community. I was therefore extremely glad to receive your Grace's circular despatch on the subject, as I felt authorised thereby to allude to it in my speech on the 26th ultimo, when opening the present Session of Parliament.

"Subsequently, and on consultation with my ministry, I resolved to adopt the plan which I had followed in connection with the Indian Mutiny Relief Fund. I therefore addressed letters to the persons most likely to be useful in promoting the objects of the intended Exhibition, and invited them to meet me at my office on the 13th inst.

The meeting was very respectably attended, and I then explained my reasons for convening it. The main result was, that on my suggestion a large and influential General Committee was nominated to ensure the produce and manufactures of the Colony being worthily represented at the International Exhibition.

"That General Committee was, also at my suggestion, divided into sections, each entrusted with the duty of attending to the illustration of some leading interest of the colony, such as the pastoral, agricultural, mining, &c.

"So much at least has been accomplished, that the General Committee and various sections thereof are now formed. I am President of the General Committee, and Mr. Francis Dutton, M.P., is the Honorary Secretary, so that the Trustees can now communicate at any time with a body which I hope, to use your Grace's words, is likely to command the confidence of those who may become exhibitors.

"Another step for completing the representation of this colony has also been taken this day by myself in Executive Council, viz., the appointment in the room of Mr. Edward Stephens, lately deceased, of Mr. Alexander Laing Elder, to be the representative of the colony in London, for all purposes of the Exhibition, in conjunction with Mr. Walters, the Agent General. Mr. Elder is a gentleman for many years favourably known to the South Australians, and deservedly enjoys the general confidence and esteem of this community. I cannot, however, but express my great regret that a necessity for this appointment should have arisen, through the death of so valuable a friend to the colony as the late Mr. Edward Stephens, to whom, in recognition of his services as representative of the colony at the Statistical Congress, it had been intended to entrust the interests of South Australia in connection with the International Exhibition.

"I think there is room for congratulation as to the organised manner in which these various sections are already proceeding to work out the objects entrusted to them, and I shall be much disappointed if the wool, cereals, wines, and minerals of the colony do not rank honourably at the forthcoming Exhibition."

The finest wheat of South Australia is grown on the hills, and in order to be received in time, samples of the new wheat of the harvest of next year will be sent by an early mail by the overland route through Suez and the Mediterranean. The best samples of wheat and other grain will be sent both from the hills and plains, and samples of wool and other produce from different districts. Among the articles sent in 1851 were, wheat, barley, flour, olive oil, soap, collections of minerals, polished precious stones, a case of native gold, and a case of dried native flowers. A prize medal was awarded to the collection of wheat and flour, for South Australian wheat, and to the Burra Burra Company for specimens of copper; "honourable mention" for soap, olive oil, preserved meats, and copper ores.

I notice complaints made in the colony of the course pursued by the London agents to whom the articles were entrusted in 1851. The articles consigned to the agents were exhibited in their own names, instead of (as the Local Committee concluded they would have been) in the names of their principals. Consequently, the Local Committee were ignored in the published award lists, and secured the prize medal for the colony only after official reference through the Secretary of State. It is still a question to whom this medal belongs, and the Governor has

suggested that it should be framed, with the names of all the contributors engraved round it, and be presented to the Adelaide Institute. The Hon. S. Davenport, who was the local secretary to the South Australian Committee for 1851, states that the effect of the award to wheat and flour of the colony, highly prized as it was, failed in satisfying individual emulation and expectation, because the individual contributors were not named in the award, or the award was not to individualised wheat and flour of the seven contributors. In anticipation of other results, the Local Committee had distinctly branded the separate seven contributions. The Governor now suggests that, whatever else is done, care should be taken to attach the names of the contributors to every package, and that each should be considered as exhibited by the party so named, and not by the General Committee or the London agent. This precaution, which was overlooked on the former occasion, caused a considerable amount of dissatisfaction.

The export of wheat from South Australia is yearly increasing; in 1859 it was 70 per cent. above the average of the past five years. This increased demand for grain is, no doubt, attributable to the estimation in which South Australian wheat is held by the millers in the neighbouring colonies for mixing purposes. In each of the years 1858 and 1859 the export of wheat to Victoria alone was about 190,000 bushels, equal to about 4,200 tons of flour—the shipments of flour were 20,028 and 17,133 tons respectively. The bread-stuffs exported to New South Wales were principally in the form of wheat, the shipments in the last two years averaging about 80,000 bushels to only about 2,000 tons of flour.

The minerals shown by South Australia are likely to be interesting, forming as they do an important item in the exports of the colony. The average annual value of minerals and metals exported in the past ten years exceeds £313,000.

The list of reported mines in the colony contains the names of 15 which are at work. In the absence of any detailed information as to the quantities of ore raised in the several mines, it may be stated that the value of mineral produce exported during the past two years amounted to upwards of three millions sterling. The large extent of mineral country, and the valuable deposits of rich copper ore, &c., lately discovered, give promise of future wealth to South Australia, the magnitude of which can hardly be estimated. The general statistics show a most satisfactory development of the material resources of the colony, and illustrate the rapid progress of the agricultural, pastoral, and mining interests during the last two years.

The exports of metals and minerals during the last five years not only evidences the increased productiveness of the mines of this colony, but also that the export of manufactured copper has increased in a larger ratio than the shipment of ore in its crude state; a fact of much importance, viewed as a profitable source of employment in this branch of industry to an increasing class of the population. The increase in the average shipment of copper is thirty per cent.; of ore, only ten per cent.

The exports of lead have more than doubled, and of lead ore the shipments have increased fivefold, indicating the rapid development of this description of mineral wealth.

Vine culture is rapidly extending. The area of the vineyards on the 31st March, 1861, was 3,180 acres against 1626 acres in 1858. The number of vines in bearing in 1861, was 1,874,851 against 1,454,471 in 1859; vines not in bearing, 1,948,510 against 1,577,881 in 1859, evidencing remarkable activity in vine planting during the last two or three years. The quantity of wine made was 100,624 gallons in 1857, and 182,087 gallons in 1861. The progress of wine making does not seem to keep pace with that of vine planting, but it is probable that as South Australian Wines have now obtained a good name, greatly increased quantities will be manufactured. About 23,398 cwts. of grapes are reported as having been sold last year, but this is evidently a very defective return, as no complete account of the actual yield of grapes could be obtained. Vine growing promises to be a source of considerable profit in South Australia, and some of the sister colonies. In New South Wales there are about 1,500 acres under vineyard; in Victoria 600, and in Western Australia 363 acres.

There is every reason to hope that the wine-growing capabilities of South Australia will be well and successfully represented at the Exhibition. The special wine committee have been very active in selecting and determining upon the wines sent in, and approving those which are to be transmitted to England. This Committee would receive and adjudicate upon samples up to the end of August. Advices are already to hand of some 25 varieties approved.

Western Australia.

Passing to the colony of Western Australia, the capabilities and resources of which remained so long dormant for want of labour and capital, we find that its progress, even under many disadvantages, has been most satisfactory in all the elements which indicate substantial wealth. The colony is now in a very different position to what it was when it sought a refuge in transportation. Its agricultural and pastoral interests have been greatly enlarged, and the colonists have, in addition, those invaluable and inexhaustible resources, the copper mines and the timber forests, neither of which were productive at the former period.

In the last ten years 30,000 additional acres of land have been brought under culture. The population, which then numbered only a few thousand, has now risen to 15,000. In agricultural progress much has been done, as well as in local improvements. The live stock have greatly increased, horses nearly fourfold, cattle and sheep more than doubled, notwithstanding the increased number of mouths to be fed. The imports have risen in value from £52,000 to £137,000, and the exports from £22,000 to £93,000. What is mainly wanted here to advance Western Australian interests is greater publicity, and more frequent notice of the colony, its products and progress, wants and capabilities.

In former years this was more attended to than at present. The colony, however, should not rest apathetically content because things are better than they were, and a certain amount of government money is expended in convict maintenance. All the other Australian Colonies are using active exertions to attract the attention of intending emigrants. New South Wales and Queensland are running a race of competition for English favour. The former has just voted £55,000 for promoting voluntary and assisted emigration, and two influential commissioners are to be sent to England to agitate and lecture on the subject. Queensland has been for some time in the field with emigration funds and free grants of land, and its London agents are actively and energetically at work, while the patriotic element of voluntary subscriptions at home has also been enlisted, and large sums contributed by Miss Burdett Coutts and other well-known names, to assist out poor weavers and other distressed persons. Tasmania and Victoria are also bidding for public favour, and using all their energies to stand well with intending emigrants. And this is a proper step at the present time, when the tide has ceased to flow to the States, and there is even a reflux of English and German settlers glad to escape from the dissension and turmoil and the necessity of taking part in a struggle in which they feel no sympathy.

The large and progressive increase in the value of the exports, which have now reached nearly five times the amount of 1850, will be found principally under the heads of copper ore, timber, sandal wood, and wool.

The York Agricultural Society, without waiting the action of the Government, appointed a committee of its body, in May, for the purpose of collecting the productions of the York district and forwarding them to the Exhibition in London. The Central Committee appointed by the Governor consists of the Rev. the Dean of Perth, chairman; Messrs. Lochee, G. Shenton, Carr, and L. S. Leake

E. W. Landor, secretary. Acting by the authority of the Government, the Committee have appointed Mr. Alexander Andrews, the editor and proprietor of the *Australian Mail*, special London Commissioner for the Exhibition. The colony has had allotted to it a net space of 350 feet, and the Local Committee state that no pains will be spared to render the collection of the natural productions of Western Australia as satisfactory and complete as circumstances will admit.

The chairman of the Committee, writing in June, states:—"Mr. F. Gregory has but lately started on an exploring expedition to the northward, under the auspices of the Royal Geographical Society, and will probably, in the course of the next few months pass over a very large extent of country, the character of which has been hitherto mere matter of conjecture. The geological and botanical specimens which he is likely to bring back from this at present unknown region, would probably be to the scientific world the most interesting portion of our whole collection." The Committee hoped to complete the collection in Perth by the end of November, and would then dispatch it by first wool ship.

The Central Committee has appointed District Committees, to whom they have addressed circulars, describing their duties and suggesting the articles it would be advisable for them to collect. They have also placed themselves in communication with various parties likely to further the objects they have in view—and numerous objects intended for exhibition are coming in.

Some fine samples of copper ore have already been forwarded from the Wheel Fortune Mine.

Messrs. Yelverton and Co., assisted by Mr. Couchman, are engaged in supplying some of the finest samples of ship-timber,—Jarrah, Tooart, and Blue Gum. The Toodyay Committee are preparing to forward specimens of Shea-oak, and of various other woods in that district; also a section of a remarkably fine boss or excrescence on a Flooded-gum tree, measuring twenty-eight feet in circumference, asbestos, wool, wheat, &c. The York Committee will send samples of wheat, wool, skins of wild animals and birds, timber, fossils, clays, gums, &c. From King George's Sound some very superior specimens of Shea-oak will be sent; also a quantity of black sand, similar to the iron sand of Taranaki; and an interesting specimen of the petrified trees found in that district.

A goodly collection of ore is being made by Mr. George Shenton. Mr. L. Samson has forwarded a piece of Jarrah which has been exposed to the elements for about 30 years, and has resisted the white ant and dry rot, and is now as sound as ever. This peculiar property of the Jarrah (the only wood in all Australia possessing the quality) cannot be too often brought before the notice of the British public. A similar piece of wood, forming one of the piles of the jetty at Fremantle, and which has been 28 years in the sea, where the *teredo navalis* destroys every other wood in a few months, has been contributed by Mr. D. Scott. Some splendid planks of the Jarrah, equal in colour and grain to the finest Spanish mahogany, have been sent by Mr. King and Mr. Oriol.

Mr. Sloane has also forwarded some fine woods, for naves of wheels, spokes and fellies, &c.

Mr. W. Pearce Clifton will contribute samples of his various excellent wines; also, fine olive oil, wheat, and turned specimens of various woods.

Mr. T. Little, Mr. E. Hamersley, and other wine growers, will forward samples of colonial wine.

An elegant work-table, now being constructed for Mr. Theodore Fawcett, will be lent by him to the Committee for exhibition. A handsome work-box, the lid of which is composed of seventy-two pieces of beautiful woods, has been also obtained by the Committee.

Major Henderson, Comptroller-General, is kindly superintending the construction of a cabinet, which, we have no doubt, will excite admiration, even when compared with the woods and workmanship of Germany and France.

THE INTERNATIONAL EXHIBITION OF 1862.

APPLIANCES FOR HOUSE WARMING—COOKERY.

The subjoined has been forwarded to the Editor by Mr. Edwin Chadwick, C.B.:—

The following suggestions for testing the extent to which the objects have been attained with different classes of fire-grates, and cooking apparatus applicable to different classes of houses, have been submitted to the consideration of the Committee on Sanitary Appliances, by Dr. Sutherland, who has paid special attention to the subject, as a member of the Commission on the Construction of Barracks and Hospitals, under which, as may be seen by their Report,* analogous trials were conducted. The Committee have had under consideration arrangements with Mr. Pepper, of the Polytechnic Institution, for testing there any grates or ranges which exhibitors may choose to send, Mr. Pepper undertaking to see that the trials are conducted in the most careful and impartial manner. It has been proposed that exhibitors should be allowed to have their stoves and apparatus fed by their own men, the fuel being weighed by the officers of the Institution, and that visitors of the Polytechnic shonld be allowed to witness the experiments, and the exhibitors invited to control, by their presence, the testing of the grates and ranges of their competitors. The definitive arrangements are at present under consideration, and when some preliminary trials have been made they will be announced. Meanwhile the following are to be considered as suggestions to manufacturers, foreign as well as British, of points of attainment, and of the means of attaining them, of which it is desirable that they should, as far as practicable, make their own preliminary trials by their own available means.

It has been proved by experience that the amount of fuel consumed for domestic purposes is greatly in excess of what is required either for cooking or warming, while in public establishments, such as barracks, workhouses, &c., the fuel wasted amounts to a large item of the current expenditure. The amount of this waste may be estimated from the facts recently published in a War-office Report, which show that the amount of fuel per head required for cooking, in different large establishments examined, varies from 7 lbs. per diem, to 6 lbs., 4 lbs., 3 lbs., 2 lbs., 1 lb., the quantity diminishing with improved cooking ranges down to half a pound per head per diem, a quarter of a pound, and in one striking instance down to less than an ounce per head per diem. Similar differences are found to exist in domestic cooking ranges, leading to considerable pecuniary loss among all classes of society, but more particularly among the poor, who are often obliged to suffer serious privations from want of fuel during the winter, although the total amount consumed during the year may have been much more than requisite for all domestic purposes.

The waste is, no doubt, partly due to the extravagant use of fuel, but the Government inquiry alluded to has demonstrated that cooking ranges are frequently constructed on principles so erroneous as to render any economical use of fuel almost if not altogether impossible.

In the desire to afford every encouragement to the improvement of domestic cooking and warming apparatus, the attention of home manufacturers, and also of foreign committees, is called to the great importance of sending for exhibition contrivances which have been proved by sufficient experience to fulfil the objects required.

1st. It is suggested, as a basis of classification for both cooking apparatus and fire grates, the kind of fuel they are intended to consume, under the following heads:—

(*a.*) Coal, stating the kind.
(*b.*) Coke.
(*c.*) Wood, stating the kind.
(*d.*) Charcoal.

* *Vide* also the Report of the Commission on Warming and Ventilation.

I.—COOKING APPARATUS.

1. It is suggested that the apparatus sent for exhibition should be divided into the following classes:—

Cooking apparatus for—

(*a*.) The cottage.
(*b*.) The house.
(*c*.) The mansion.

The contrivances of class *a* should be capable of cooking the ordinary food of the working classes, heating the cottage, and affording heat for the customary processes of baking, washing, ironing, &c.

The contrivances of class *b* should be adopted simply for kitchen purposes among the middle classes, and should be capable of cooking for from four to six or eight persons.

The contrivances of class *c* should be capable of being used for the various processes of the *cuisine* among the richer classes, such as roasting, baking, boiling, stewing, steaming, in short, preparing a dinner for 12 or more persons.

2. The cooking apparatus of each class should be capable of doing their work with a minimum quantity of fuel, and the apparatus used simply as kitchen ranges should not overheat the kitchen.

3. The following are suggested as the points to be kept in view during the preliminary trials:—

1. The time required to raise the temperature of the oven to 260° Fahr.

2. The quantity of coal required to raise it to that temperature, and to keep it at the same temperature for two hours, without raising the temperature above 260° Fahr.

3. How long it takes to raise the temperature of water to 212° Fahr. in the boiler of each class of apparatus; namely, one gallon in the cottage stove, four gallons in the house stove, eight gallons in the mansion stove. In each case the nature and quality of fuel employed should be stated.

4. The heat of the oven fire should be tested, by placing before it a board five feet square, lined with tin plate, having a small hole in the centre, through which the radiant heat of the fire passes, to fall on a bright bulb thermometer placed behind the board. This board to be placed five feet from the fire, and the temperature noted.

5. When steam is used for cooking, the test to be used should be the pressure exerted through a one-inch tube at a distance of nine feet from the fire, noting the quantity and quality of the coals used, the time required to obtain the pressure, and the amount of fuel necessary for keeping it up for two hours.

6. If there be a circulating hot-water cistern for baths, &c., the quantity and quality of the coal and the time required to raise 20 gallons of water to a temperatnre of 212° Fahr. should be noted.

7. All cooking apparatus intended for competitive trial should be, as far as practicable, submitted by their inventors or exhibitors to the preliminary trials mentioned above; the results certified.

8. Various forms of cooking utensils which may be intended for competitive trial should be submitted to such preliminary tests as their inventors consider necessary, and the results certified, together with a statement of the advantages possessed by such utensils.

II.—IMPROVED FIRE GRATES.

Under this head are included all open fire-places, as contra-distinguished from closed stoves, adapted for rooms of different sizes, in different classes of houses.

1. The improvements which it is desired to call forth are:—

(*a*.) Increased heating-power in the grate with a diminished consumption of fuel.

(*b*.) The combination of ventilation, by means of moderately warmed air, with warming.

2. The loss of fuel, and consequently of heat, in the ordinary fire grate is equal to from one-half to three-fourths of the entire amount of fuel consumed. It is desirable to direct attention to this great source of economy, with the view to obtaining the maximum effect of the fuel, combined with a healthy use of it.

3. Improved radiating fire grates would fulfil the conditions up to a certain point, but these grates would require to have the means of ventilation provided also.

4. The unconsumed fuel or smoke, and the waste heat which at present passes up the chimney, are, however, the chief sources out of which the economy is to be effected.

5. All such improved grates should be submitted to the following preliminary trials:—

(*a*.) The temperature of the air outside the building and inside the room, at various points, to be ascertained by fixed thermometers, not exposed to radiation.

(*b*.) The fire to be lighted with the quantity of coal required to fill the grate; the weight to be stated.

(*c*.) The temperature of the air outside and inside the room to be registered every ten minutes from the time of lighting the fire. The inside thermometers to be placed, one near the roof, one six inches from the floor, ten feet from the fire, and shaded from radiation; other two thermometers in opposite corners. The length, breadth, and height of room to be given, also the number of windows, and their breadth and height, and whether of the ordinary thinness of glass.

(*d*.) The quantity of air in cubic feet per hour passing up the chimney to be stated, also the section of the chimney, its height, and the temperature of the air in it. The method employed for ascertaining the quantity of air to be stated.

(*e*.) The quantity and temperature, taken every ten minutes, of fresh warmed air, stated in cubic feet, passing into the room. The section of the warm air inlet and its position to be stated. The means of ascertaining the quantity of air to be given.

(*f*.) After the air in the room has arrived at its maximum temperature, the additional quantity of fuel required to keep it at that point for four hours to be given, over and above the quantity first used for lighting the fire.

(*g*.) It is suggested that contrivances for the prevention of smoke, so as to increase the heating power of the fuel, should form part of the improvements in cooking ranges and fire grates.

(*h*.) Certified results of trials should be forwarded with fire grates proposed to be exhibited or to be retested for competition.

PRODUCTS OF ST. VINCENT.

The following is extracted from Governor Nesbitt's dispatch:—

"By the return of exports it will be seen that from this volcanic island several hundred tons of pozzolani were exported in the year 1859, principally to Bermuda, Barbados, and Demerara. I am not aware whether the composition be the same as the Italian pozzolani, but I understood that it forms, mixed with about two thirds of lime, an excellent hydraulic mortar, and as a cement for pavement or otherwise, thus mixed, is useful for all similar purposes as the Roman cement. The quantity of this earth is abundant, and is shipped in the harbour of Kingstown, St. Vincent, at the rate of eight shillings per ton.

"There are some interesting productions in the Island of St. Vincent not specified in the blue book.

"Among these conspicuously prominent, on hill, in valley, and continually meeting the traveller's eye, and as if of spontaneous luxuriant growth, are the bread fruit trees, bearing in the greatest abundance food as nutritious as the yam and potato; the productions of these trees are, I understand, a great resource for the families of the labouring classes, placing them in a much more independent position to similar classes in Barbados, Jamaica, and other West India Islands, where the bread fruit tree is not multiplied to the same bountiful extent.

"Another natural production is chalybeate water, welling tepidly from various springs in this island.

"Numerous magnificent mountain cabbage trees of gigantic proportions adorn the country. There are a variety of other tall and stately palm trees, but the cocoa nut palm trees here, as in many of the West Indian islands, have in great numbers, from some insect blight, died out, while most of living ones exhibit a moribnnd appearance.

"The bamboo cane is in luxuriant growth here, is very ornamental, and is useful for fences, and as conduits for the streams from the moumtains of this well-watered island.

"Insect life actively abounds after dark, innumerable large fire-flies emitting vivid flashes shooting incessantly through the trees in all directions. The continuous noise of varied other insects dutring the night at my residence, 'The Garden,' resembles somewhat the ticking of numbers of clocks, accompanied by the sound of an occasional castanet, all in discordant chorus, to which, however, time and custom gradually dull the ear."

OYSTER FISHERIES.

At the recent Colchester Oyster Feast, in the course of the proceedings, Mr. Papillon, M.P., read an extract to show that the grand secret of successful oyster culture lies in the fact of the seed obtaining an immediate and permanent resting-place. In order to afford points of attachment the French pisciculturists have hit upon the plan of sinking in the water a series of fascines, constructed out of branches of trees, and these, resting upon an artificial bottom composed of fragments of stone and brick and pieces of broken pottery ware, afford capital breeding ground for any quantity of oysters. As a proof of this 20,000 small oysters were found attached to a branch plucked from one of the beds. One of the official reports of the fisheries states that the total expense of forming an oyster bank was 221 fr., and if 300 fascines laid down upon it be multiplied by 20,000, the number of oysters they contain, it would be seen that 6,000,000 were obtained, which at 20 fr. per 1,000, would produce 120,000 fr. for the 221 fr. originally expended.

BRITISH ASSOCIATION 1861.

The following Paper was read before the Mechanical Section:—

ON EXPERIMENTS ON THE GAUGING OF WATER BY TRIANGULAR NOTCHES. BY JAMES THOMSON, A.M., PROFESSOR OF CIVIL ENGINEERING, QUEEN'S COLLEGE, BELFAST.

In 1858 I presented to the Association an interim report on the new method which I had proposed for the gauging of flowing water by triangular (or V-shaped) notches, in vertical plates, instead of the rectangular notches, with level bottom and upright sides, in ordinary use. I there pointed out that the ordinary rectangular notches, although for many purposes suitable and convenient, are but ill-adapted for the measurement of very variable quantities of water, such as commonly occur to the engineer to be gauged in rivers and streams; because, if the rectangular notch be made wide enough to allow the water to pass through it in flood times, it must be so wide that for long periods, in moderately dry weather, the water flows so shallow over its crest, that its indications cannot be relied on. I showed that this objection would be removed by the employment of triangular notches, because, in them, when the quantity flowing is small, the flow is confined to a narrow and shallow space, admitting of accurate measurement; and as the quantity flowing increases, the width and depth of the space occupied in the notch increase both in the same ratio, and the space remains of the same form as before, though increased in magnitude. I proposed that in cases in which it might not be convenient to form a deep pool of quiet water at the upstream side of the weir-board, the bottom of the channel of approach, when the triangular notch is used, may be formed as a level floor, starting exactly from the vertex of the notch, and extending both upstream and laterally, so far as that the water entering on it at its margin may be practically considered as still water of which the height of the surface above the vortex of the notch may be measured in order to determine the quantity flowing.

I indicated theoretic considerations which led to the anticipation that in the triangular notch, both without and with the floor, the quantity of flowing would be proportional, or very nearly so, to the $\frac{5}{2}$ power of the height of the still water surface above the vertex of the notch. As the result of moderately accurate experiments which I had at that time been able to make on the flow in a right-angled notch, without floor, I gave the formula $Q = 0{\cdot}317\ H^{\frac{5}{2}}$, where Q is the quantity of water in cubic feet per minute, and H the head of water, as measured vertically, in inches, from the still water level of the pool down to the vertex of the notch. This formula I submitted at that time temporarily, as being accurate enough for use, for many ordinary practical purposes, for the measurement of water by notches similar to the one experimented on, and for quantities of water limited to nearly the same range as those in the experiments (from about two to ten cubic feet per minute), but as being subject to amendment by future experiments which might be of greater accuracy, and might extend over a wider range of quantities of water. Having been requested by the General Committee of the Association to continue my experiments on this subject, with a grant placed at my disposal for the purpose, I have, in the course of last summer and of the present summer, devoted much time to the carrying out of more extended and more accurate experiments. The results which I have now obtained are highly satisfactory. I am confident of their being very accurate. I find them to be in close accordance with the law which had been indicated by theoretical considerations; and I am satisfied that the new system of gauging, now by these experiments made completely ready for general application, will prove to be of great practical utility, and will afford, for a large class of cases, important advantages over the ordinary methods—for such cases, especially, as the very varying flows of rivers and streams.

The experiments were made in the open air, in a field adjacent to a corn mill belonging to Mr. Henry Neeson, in Carr's Glen, near Belfast.

The water supply was obtained from the course leading to the water-wheel of the mill, and means were arranged to allow of a regulated supply, variable at pleasure, being drawn from that course to flow into a pond, in one side of which the weir board with the experimental notch was inserted. The inflowing stream was so screened from the part of the pond next the guage notch, as to prevent any sensible agitation being propagated from it to the notch, or to the place where the water level was measured. For measuring the water level, a vertical slide wand of wood was used, with the bottom end cut to the form of a hook, the point of which was a small level surface of about one-eighth of an inch square. This point of the hook, by being brought up to the surface of the water from below, gave a very accurate means for determining the water level, or its rise or fall, which could be read off by an index mark near the top of the wand, sliding in contact with the edge of a scale of inches on the fixed framing which carries the wand.

By other experimenters a sharp-pointed hook, like a fishing hook, has sometimes, especially of late, been used for the same purpose, and such a hook affords very accurate indications. The result of my experience, however, leads me to incline to prefer something larger than the sharp-pointed hook, and capable of producing an effect on the water surface more easily seen than that of a sharp-pointed hook; and on the whole I would recommend a

level line like a knife edge, which might be from one-eighth to half an inch long, in preference either to a blunt point with level top, or a sharp point. The blunt point which I used was so small, however, as to suit very perfectly. If the point be too large, it holds the water up too much on its top, as the water in the pond descends, and makes too deep a pit in the surface as the water ascends and begins to flow over it. The knife edge would be free from this kind of action, and would, I conceive, serve every purpose perfectly, except when the water has a sensible velocity of flow past the hook, and in that case, perhaps, the sharp point, like that of a fishing hook, might be best.

To afford the means for keeping the water surface during an experiment exactly at a constant level, as indicated by the point of the wooden hook, a small outlet waste sluice was fitted in the weir board. The quantity of water admitted to the pond was always adjusted so as to be slightly in excess of that required to maintain the water level in the pond slightly above the height at which the hook was fixed for that experiment. Then a person lying down, so as to get a close view of the contact of the water surface with the point of the hook, worked this little waste or regulating sluice, so as to maintain the water level constantly coincident with the point of the hook.

The water issuing from the experimental notch was caught in a long trough, which conveyed it forward with slight declivity, so as to be about seven or eight feet above the ground further down the hill side, where two large measuring barrels were placed side by side at about six feet distance apart from centre to centre. Across and underneath the end of the long trough just mentioned, a tilting trough 6 ft. long was placed, and it was connected at its middle with the end of the long trough by a leather flexible joint, in such a way that it would receive the whole of the water without loss, and convey it at pleasure to either of the barrels, according as it was tilted to one side or the other.

Each barrel had a valve in the bottom, covering an aperture six inches square, and the valve could be opened at pleasure, and was capable of emptying the barrel very speedily. The capacity of the two barrels jointly was about 130 gallons, and their content up to marks fixed near the top for the purpose of the experiments was accurately ascertained by gaugings repeated several times with two or four-gallon measures with narrow necks.

By tilting the small trough so as to deliver the water alternately into the one barrel and the other, and emptying each barrel by its valve while the other was filling, the process of measuring the flowing water could be accurately carried on for as long time as might be desired. With this apparatus, quantities of water up to about 38 cubic feet per minute could be measured with very satisfactory accuracy.

The experiments of which I have now to report the results were made on two widths of notches in vertical plane surfaces. The notches were accurately formed in thin sheet iron, and were fixed so as to present next the water in the pond a plane surface, continuous with that of the weir board.

The one notch was right-angled, with its sides sloping at 45° with the horizon, so that its horizontal width was twice its depth. The other notch had its sides each sloping two horizontal to one vertical, so that its horizontal width was four times its depth.

In each case experiments were made both on the simple notch without a floor, and on the same notch with a level floor starting from its vertex, and extending for a considerable distance both up stream and laterally. The floor extended about two feet on each side of the centre of the notch, and about $2\frac{1}{2}$ feet in the direction up stream, and this size was sufficient to allow the water to enter on it with only a very slow motion, so slow as to be quite unimportant. The height of the water surface above the vertex of the notch was measured by the sliding hook at a place outside the floor, where the water of the pond was deep and still.

The principal results of the experiments on the flow of the water in the right-angled notch without floor are briefly given in the annexed table, the quantity of water

H.	Q.	C.
7	39·69	·3061
6	26·87	·3048
5	17·07	.3053
4	9.819	·3068
3	4·780	·3067
2	1·748	·3088

given in column 2 for each height of 2, 3, 4, 5, 6, and 7 inches being the average obtained from numerous experiments comprised in two series, one made in 1860, and the other made in 1861, as a check on the former set, and with a view to the attainment of greater certainty on one or two points of slight doubt. The second set was quite independent of the first, the various instruments and gaugings being made entirely anew. The two sets agreed very closely, and I present an average of the two sets in the table as being probably a little more nearly true than either of them separately. The third column contains the values of the co-efficient C, calculated for the formula $Q = C H^{\frac{5}{2}}$, from the several heights and corresponding quantities of water given in the first and second columns, H being the height, as measured vertically in inches from the vertex of the notch up to the still-water surface of the pond; and Q being the corresponding quantity of water in cubic feet per minute, as ascertained by the experiments. It will be observed from this table that, while the quantity of water varies so greatly as from $1\frac{3}{4}$ cubic feet per minute to 39, the co-efficient C remains almost absolutely constant, and thus the theoretic anticipation that the quantity should be proportional, or very nearly so, to the $\frac{5}{2}$ power of the depth, is fully confirmed by experiment. The mean of these six values of C is ·3064; but, being inclined to give rather more weight in the determination of the co-efficient as to its amount, to some of the experiments made this year than to those of last year, I adopt ·305 as the co-efficient, so that the formula for the right-angled notch without floor will be $Q = \cdot305 H^{\frac{5}{2}}$. My experiments on the right-angled notch with the level floor fitted as already described, comprised the flow of water for depths of 2, 3, 4, 5, and 6 inches. They indicate no variation in the value of C for different depths of water, but what may be attributed to the slight errors of observation. The mean value which they show for C is ·308, and as this differs so little from that in the formula for the same notch without the floor, and as the difference is within the limits of the errors of observation, I would say that the experiments prove that, with the right angled notch, the introduction of the floor produces scarcely any increase or diminution on the quantity flowing for any given depth, but do not show what the amount of any such small increase or diminution may be, and I would give the formula $Q = \cdot305 H^{\frac{5}{2}}$ as sufficiently accurate for use in both cases. The experiments, in both cases, were made with care, and are without doubt of very satisfactory accuracy, but those for the notch without the floor are, I consider, slightly the more accurate of the two sets.

The experiments with the notch with edges sloping two horizontal to one vertical, showed an altered feature in the flow of the issuing vein as compared with the flow of the vein issuing from the right-angled notch. The edges of the vein on issuing from the notch with slopes two to one, had a great tendency to cling to the outside of the iron notch and weir board, while the portions of the vein issuing at the deeper parts of the notch would shoot out and fall clear of the weir board. Thus, the vein of water assumed the appearance of a transparent bell, like as of glass, or rather of the half of a bell closed in on one side by the weir board and enclosing air. Some of this air was usually carried away in bubbles by the stream at bottom, and the remainder continued shut up by the bell of water, and existing under slightly less than atmospheric pressure.

The diminution of pressure of the enclosed air was

manifested by the sides of the bell being drawn in towards one another, and sometimes even drawn together, so as to collapse with one another at their edges which clung to the outside of the weir board.

On the full atmospheric pressure being admitted, by the insertion of a knife into the bell of falling water, the collapsed sides would immediately spring out again. The vein of water did not always form itself into the bell, and when the bell was formed the tendency to the withdrawal of air in bubbles was not constant, but was subject to various casual influences. Now it evidently could not be supposed that the formation of the bell and the diminution of the pressure of the confined air could occur as described, without producing some irregular influence on the quantity flowing through the notch for any particular depth of flow, and this circumstance must detract more or less from the value of the wider notches as means for gauging water in comparison with the right-angled notch with angles at 45° with the horizon. I therefore made numerous experiments to determine what might be the amount of the ordinary, or of the greatest effect, due to the diminution of pressure of the air within the bell. I usually failed to meet with any perceptible alteration in the quantity flowing due to this cause, but sometimes the quantity seemed to be increased by some fraction, such as one, or perhaps two, per cent. On the whole, then, I do not think that this circumstance need prevent the use, for many practical purposes, of notches of any desired width for a given depth.

My experiments give as the formula for the notch, with slopes of two horizontal to one vertical, and without the floor:—

$$Q = 0{\cdot}636\ H^{\frac{5}{2}},$$

and for the same notch, with the horizontal floor at the level of its vertex:—

$$Q = 0{\cdot}628\ H^{\frac{5}{2}}.$$

In all the experiments from which these formulas are derived, the bell of falling water was kept open by the insertion of a knife or strip of iron, so as to admit the atmospheric pressure to the interior. The quantity flowing at various depths was not far from being proportional to the $\frac{5}{2}$ power of the depth, but it appeared that the co-efficient in the formula increased slightly for very small depths, such as one or two inches. For instance, in the notch with slopes 2 to 1 without the floor, the co-efficient for the depth of two inches came out experimentally 0·649, instead of 0·636, which appeared to be very correctly its amount for four inches depth. It is possible that the deviation from proportionality to the $\frac{5}{2}$ power of the depth, which in this notch has appeared to be greater than in the right-angled notch, may be partly due to small errors in the experiments on this notch, and partly to the clinging of the falling vein of water to the outside of the notch, which would evidently produce a much greater proportionate effect on the very small flows than on great flows. The special purpose for which the wide notches have been proposed, is to serve for the measurement of wide rivers or streams, in cases in which it would be inconvenient or impracticable to dam them up deep enough to effect their flow through a right-angled notch. In such cases I would now further propose that, instead of a single wide notch, two, three, or more, right-angled notches might be formed side by side in the same weir board, with their vertices at the same level. In cases in which this method may be selected, the persons using it, or making comparisons of guagings obtained by it, will have the satisfaction of being concerned with only a single standard form of guage notch throughout the investigation in which they may be engaged.

By comparison of the formulas given above for the flows through the two notches experimented on, of which one is twice as wide for a given depth as the other, it will be seen that in the formula for the wider notch the co-efficient ·636 is rather more than double the co-efficient ·305 in the other. This indicates that as the width of a notch considered as variable increases from that of a right-angled notch upwards, the quantity of water flowing increases somewhat more rapidly than the width of a notch for a given depth. Now, it is to be observed that the contraction of the stream issuing from an orifice open above in a vertical plate is of two distinct kinds at different parts round the surface of the vein. One of these kinds is the contraction at the places where the water shoots off from the edges of the plate. The curved surface of the fluid leaving the plate is necessarily tangential with the surface of the plate along which the water has been flowing, as an infinite force would be required to divert any moving particle suddenly out of its previous course.* The other kind of contraction in orifices open above consists in the sinking of the upper surface, which begins gradually within the pond or reservoir, and continues after the water has passed the orifice. These two contractions come into play in very different degrees, according as the notch (whether triangular, rectangular, or with curved edges) is made deep and narrow, or wide and shallow. From considerations of the kind here briefly touched upon, I would not be disposed to expect theoretically that the co-efficient C for the formula for V-shaped notches should be at all truly proportional to the horizontal width of the orifice for a given depth; and the experimental results last referred to are in accordance with this supposition. I would, however, think that from the experimental determination now arrived at, of the co-efficient for a notch so wide as four times its depth, we might very safely, or without danger of falling into important error, pass on to notches wider in any degree, by simply increasing the co-efficient in the same ratio as the width of the notch for a given depth is increased.

EXTRACTS FROM THE REPORTS OF H.B.M. CONSULS.

(*Continued from page 795.*)

THE COMMERCIAL MARINE OF FINLAND.—The commercial marine of Finland affords employment and the means of livelihood to the greater portion of the population along the coast, and a safe and lucrative investment to the merchant. Previous to the war, the merchantmen of Finland were engaged in the carrying trade in nearly every part of the globe, and occupied a conspicuous rôle amongst the maritime nations; but, what with the forced sales before the commencement of hostilities in 1854, the subsequent captures, and those destroyed by our cruisers, their merchant fleet was reduced to less than half its original number. The earliest authentic returns I have been able to procure relative to the commercial marine of Finland, is for the year 1826, when the fleet consisted of 250 vessels of 34,132 tons burden, and afforded employment to 2,306 hands. Ten years subsequently, or in 1836, the number of vessels had increased to 380, of 62,492 tons, with 3,580 hands, showing an addition of 130 vessels of 28,360 tons during the short period of ten years. In 1846, the number had reached 502 vessels, with a burden of 89,586 tons, and employing 5,490 seamen, showing the same rapid progress, 122 vessels of 27,094 tons, having been added to the merchant fleet of the country. At the close of the year 1852, when the commercial marine of Finland may be said to have reached its climax, and before any of the political troubles which subsequently ensued had disturbed the horizon, or induced Finnish shipowners to dispose of their vessels, the fleet numbered 507 vessels, of a collective tonnage of 108,760 tons, and afforded employment to 5,760 hands, showing an increase of 257 vessels and 74,628 tons, or double the number of vessels and tonnage since the year 1826. But this flourishing

* This condition appears not to have been generally noticed by experimenters and writers on hydrodynamics. Even MM. Poncelet and Lesbros, in their delineations of the forms of veins of water issuing from orifices in these plates, after elaborate measurements of those forms, represent the surface of the fluid as making a sharp angle with the plate in leaving its edge.

state of things was suddenly subjected to a cruel change, as, during 1853 and 1854, 158 vessels, of 51,698 tons, were sold and disposed of abroad, and 89 vessels (19,088 tons) were captured or destroyed by the allied fleets, leaving, after deducting losses by shipwreck, 295 vessels, of 43,736 tons, as forming the sum total of the Finland merchant service on the 1st of January 1856. But, in addition to the actual merchant fleet, there exists in Finland a large number of coasting vessels, not adapted for long voyages, which are owned and navigated by the peasantry or inhabitants of the coast or inland lakes. This separate class of vessels numbered, in 1850, as many as 927 craft of 49,300 tons, and afforded employment to upwards of 3,500 hands. These vessels are all very unwieldly, shaped after the fashion of a Dutch lugger; the largest carry three masts and load about 140 tons, others are only ten to twelve tons burden. They are chiefly employed in the transport of deals, planks, and battens, from the saw-mills on the shores of Saima and other lakes to the seaports, for re-shipment abroad, and also in bringing marble, granite, and iron from the quarries and mines near Sordavala and Pitkäranda to St. Petersburg, taking generally, as a return cargo, meal, flour, and colonial produce for the supply of their home districts. Upwards of 300 tons of bark are annually brought down from the Ladoga Lake in these vessels for the use of the tanneries at St. Petersburg. Helsingfors, and other towns along the coast, are supplied with quantities of firewood, fish, and farm produce from the surrounding districts, by means of these small craft. During the season the trade carried on by them between either shore of the Gulf of Bothnia is very considerable, the inhabitants of North-western Finland being, to a great extent, dependent on Sweden for the disposal of their agricultural produce and the sale of the not unimportant article—fish, of which the salmon and strömming are caught in very large quantities, and which are generally bartered away for colonial produce, tobacco, and salt. To prove the importance of the trade with Sweden in these coasting vessels, I find that, in 1852, as many as 231 Finnish vessels, together of 18,262 tons, entered inwards with cargoes in Swedish ports, the value of the imports being 691,000 rix banco, equivalent to £57,626; whilst 314 Finnish vessels cleared outwards with cargoes of a burden of 43,918 tons, the estimated value of the exports were noted at 651,000 rix banco, equal to £54,250. There are a great number of important shipbuilding establishments along the coast; in fact, every port of any importance is possessed of one; and in 1857 every yard was occupied in the construction of sea-going ships, in order to replace the large number captured or disposed of during the late war; and I am under the impression that another ten years will see the commercial marine of Finland occuping the same important rank it formerly held. Finnish vessels are all exclusively built of fir, and generally iron fastened; and on an average costs, fully rigged, 65 to 70 rubles, equal to £11 to £12 per ton. The importation of vessels, excepting such as are built of oak, is prohibited; such as are of oak pay a duty of 16⅔ per cent. of their value.

FANNING'S ISLAND (SANDWICH ISLANDS. — Fanning's Island, besides large quantities of cocoanuts, produces bananas, arrow-root, and abundance of firewood. It is about ten miles in length, and of an oblong shape, having in its centre a deep lagoon, capable of holding the whole of the British navy, and abounding with a variety of very fine fish. This lagoon communicates with the sea by a channel that has 4½ fathoms of water, and is a quarter of a mile wide, with a rapid ebb and flow of the tide. On the seaward side of the island, four miles from the entrance into the lagoon, and one mile from the shore, there is pretty good anchorage in ten fathoms water, for about thirty vessels. A convenient wharf has been erected inside the lagoon, so that a vessel of even 1,000 can easily be hove down; and the British barque *Sutton*, of 260 tons, was hove down and repaired there in 1852. It appears, likewise, that the highest hillock or point, on Fanning's Island, is not more than about twenty feet above the level of the sea; notwithstanding which, abundance of good fresh water can be obtained by digging one or two feet into the light sandy soil; and the trees, which afford good hard firewood, are many of them of rather a large size, although not lofty.

BESSARABIAN MOLDAVIA.—The territory recently annexed to Moldavia, differs in no respect from that of the province to which it now belongs. The land is equally fertile and capable of producing a very large amount of grain and other articles of commerce. It is, however, but thinly populated, as many of the inhabitants retired with the Russians. Those remaining are chiefly Bulgarians and Moldavians. Agriculture is even in a more primitive state than in Moldavia, as scarcely any European implements or machines have as yet been introduced. The only means of transport from the interior is by carts drawn by oxen or horses. There are several lakes which extend nearly to the frontier, and which might, with a trifling outlay, be rendered navigable for lighters of several hundred tons burden, and as they all have a communication with the Danube, might be made an easy and economical means of bringing produce to the shipping ports. Nearer to the sea are several salt lakes, which are a source of considerable revenue, as they produce a sufficient quantity of salt, not only for the wants of the inhabitants of the district, but for those of the whole of Bessarabia and part of Lower Russia. The question of free transit for Russian produce passing through the Moldavian territory for exportation has at last been settled, and such produce is now to be subjected to no duty beyond the payment of one piastre per kilo, which will be expended on the improvement of the streets and the embellishment of the town of Ismail. The chief towns in the interior are Bolgrad, Cahul, and Leova; and on the banks of the Danube, Ismail, Reni, Kilia, and Vilcof. The two principal ports from whence shipments are made by sea-going vessels are Ismail and Reni; the grain produced in the neighbourhood of Kilia and Vilcof being almost entirely sent in small river craft to Ismail. The port of Ismail is well adapted for all purposes of shipping, having a long extent of open natural quay, with deep water, where upwards of 100 vessels could commodiously load at one time. The chief articles of export are grain and oleaginous seeds; wool, tallow, hides, cheese, butter, oxen, and sheep. The position of the port of Ismail is unfavourable to its becoming a place of great commercial importance, as vessels loading here have to return for a distance of about fourteen miles against a strong current, in order to get into the navigable channel of the river. The deepening of the Kilia mouth would be the only means of insuring the prosperity, not only of this town, but also the whole of the new territory, and hopes are entertained that the Moldavian Government will take the necessary steps to effect this very desirable object.

GUANO.—The Island of Navassa, Windward Islands, is about 2½ miles long from its north-west point to its south-east, and about 2 miles wide at its east end, which is the broadest part of the island. It is surrounded by cliffs of from fifteen to twenty feet high, except the western portion of the north side (where there is indifferent landing in calm weather on the rocks, which are only a few feet high), and, one spot on the south west side, where there is a sloping place which is now occupied by an American company, who are loading guano, which is plentiful on the level ground. From the top of the cliffs the land rises at an angle of nearly 45° to the height of about 300 feet; from thence the top of the island is level; and, although there is no soil on the surface where guano occurs, yet it is covered with brushwood and small trees, which spring up between the stones. They are, for the most part, cabbage palms (which grow to the height of from twelve to fifteen feet), the palmetta—a species of sea grape, and one or two other shrubs—of which we do not know the names. The north-west part of the island, where most of the guano lies, appears to be composed of

limestone, and the remainder of scoriæ. The south-west side is the resort of great numbers of boobies and other sea fowl, who build their nest on the rocks and in the low trees which grow on the rising ground above the cliffs. The Americans number about fifty people on the island, and load their vessels with guano by means of a wire rope, down which they lower the bags from the top of the hills to the landing place, from which it is taken off by boats in bad whether, but in moderate weather the vessels come alongside the loading stage. They have already exported from the island about 1,000 tons, and have stored up, ready for shipping, about 3,000 tons. The part of the island explored cannot contain less than 1,000,000 tons; but there is no doubt more on the north-east part, which was not visited. There is a very fair anchorage on the lee side, abreast the loading stage, in full sixteen fathoms (sand), within half-a-mile from the shore; the vessels waiting to load anchor within a cable's length, in about twelve fathoms—but the ground is rocky and foul, and they have already lost two anchors there.

Home Correspondence.

STRUCTURE OF METALS.

Sir,—Resuming the subject of the structure of metals, contained in my letter of the 18th inst., and especially of copper, to which I would particularly refer at present, it appears to me probable that the cells in metals are vacuums, or, at least, are not filled with atmospheric air, for this reason—when a piece of metallic copper is newly broken from the mass, the inner surfaces of its cells reflect light most brilliantly, but, when exposed to the air, they quickly oxidise and lose their brilliancy; the same effect is also seen on silver to some extent, but the oxidising effect of the air not being so great on silver as on copper, the cells of the former retain their lustre longer.

It is worthy of remark that silver and copper, which show the greatest perfection of the cell system, are those which are known to be the best conductors of heat and electricity; this fact seems to indicate that these forces may travel through the cells, the extremely sensitive and brilliant surfaces of which, with the large area afforded in the aggregate by the myriads of cells which exist even in a wire, would apparently greatly facilitate. The custom of polishing metals to prevent the radiation of heat appears to confirm this view of it, for polishing metals seems to me to be only a closing of such of the cells as may have been opened by tarnish, a partial oxidation of the surface which has taken place, or by other accidental causes.

Observations on a large number of specimens have caused me to form the following opinion on copper:—That the best "select copper," which is the most ductile and malleable, owes its superiority in these qualities to the perfection of its cell system, or in other words, to its freedom from an intermixture of the red oxide of copper, the principal difference between different samples of copper being the quantity of the red oxide that may be intermixed with the metallic mass. This intermixture is exceedingly interesting and beautiful; the form of metallic copper being naturally cellular, the form of the red oxide of copper is globular, so that in an impure sample of copper the minute globules of the red oxide are seen interspersed with the cells of the metallic, the former being of a beautiful ruby colour, presenting a rich variety of colour with the metallic, but this variety of constituent sadly deranges the structure and lines of fracture of the mass, and leads me to believe that the process of toughening the metal, by what is called "poling" during the refining, is principally, if not entirely, a mechanical one; for, by the ebullition caused by the plunging of the pole into the mass of fluid metal, the red oxide is liberated, and from its less specific gravity it instantly rises to the surface.

I am, &c., W. VIVIAN.

Pary's Mines, Bangor, North Wales,
October 28th, 1861.

Proceedings of Institutions.

Bradford Mechanics' Institute. — The twenty-ninth annual report records a decrease during the year in the number of subscribers, a circumstance to be accounted for by the very depressed state of trade during last winter. The following is a classified list of the members and subscribers during the last two years:—

	March 31, 1861.	March 31, 1860.
Life members	126	126
Members at 12s. per annum	477	486
Subscribers at 10s. „	168	182
Ditto, 8s. „	348	394
Female subscribers at 6s. per ann.	47	52
Firms	9	13
Persons nominated by firms	73	94
	1,248	1,347

The subscriptions for the year amount to £512 12s. 10d., and the receipts from other sources to £185 18s., being a total decrease of £26 as compared with last year's receipts. The total expenditure has been £703 4s. 2d., reducing the balance in hand from £48 14s. 5d. to £44 1s. 1d. Notwithstanding this reduction in the total receipts, it has not been found necessary to reduce the expenditure in the various departments of the Institute's operations. In the library the expenditure has been increased by about £10, principally in the re-binding of books; and the amount paid for teacher's salaries has been again increased by more than £20. The increase in the library during the year has been 308 volumes, raising the total to 7,758. There have also been purchased 52 volumes to supply the places of worn-out books. There has been an increase in the number of volumes circulated, though the library has been open four days less than in the preceding year. In 1859-60 the issues were 35,498; last year they reached 36,368, being an advance on the year of 870, and on the daily average of 4·56. The interest in the news and reading rooms continues without abatement. There is a good attendance—both the rooms being well frequented, especially in the evening, when they are often crowded, affording conclusive evidence that more space is wanted to make this part of the operations of the Institute both more complete and self-sustaining. The lectures have been of an unusually varied character, comprising subjects in literature, biography, and science—the latter class bearing a larger proportion than usual; and although the Committee cannot yet speak of them as being positively popular, they are glad to find them every season increasing in favour with the more intelligent of the subscribers. The following is a list of the lectures, distinguishing by an asterisk those which were gratuitous:—1860.—*Rev. Dr. Burnet, Vicar, "The Importance of Character." *Rev. S. G. Green, B.A., "The Almanac; or, Days, Weeks, Months, and Years." Mons. Louis Blanc, "The Mysterious Personages and Agencies in France towards the end of the 18th Century." George Grossmith, Esq., "Sketches by Boz." George Dawson, Esq., M.A., "John Calvin." E. Lankester, Esq., M.D., F.R.S., "Animals used by Man as Food." *Mr. S. H. Kerr, Ph.D., "The Earth's Tenants, and their Traces." 1861.—*Rev. R. J. Campbell, M.A., "Eliot's Prison: one of the Spring-heads of English Liberty." *Rev. Canon Fawcett, M.A., "Geology: The Coal Formation." George Dawson, Esq., M.A., William Cobbett," George Grossmith, Esq., "The Ludicrous in Life." L. H. Grindon, Esq., "The Analogies of Plants and Animals." *Rev. J. P. Chown, "Six Days in Rome." The operations of the class department during the past session have been very encouraging, and the results bear favourable comparison with those of any previous period. Owing to the difficulty pf procuring gratuitous teachers, it was found necessary still further to increase the number of professional teachers; and, with the exception of the Physical Geography Class, which was obliged to be given up for

the want of pupils, all the advanced classes formed last year have been continued. The attendance at these classes, however, has scarcely reached the expectations o the Committee. In the Writing and Arithmetic Class the attendance continues extraordinarily large, and call for more convenient and comfortable accommodation. A novelty, in the nature of a Class for Mutual Improvement in Natural Philosophy, has been attempted during the session, and its success has been such as to lead to a hope of its continuance. Papers have been read by its members in turn upon different subjects, generally illustrated by interesting experiments. The number of members attending the French Class has been very large, and contrasts singularly with the small number constituting the German Class. The Drawing Class has sustained a diminution in its numbers; this the Committee trust is but temporary, and that the class will in future meet with the success which the eminence of the drawing-masters merits. The following table shows the classes which have been in operation throughout the session, the number of pupils on the books, and the average attendance in each class:—

Name of Class.	No. on Books.	Average Attendance.	Paid or gratuitous.
Writing and Arithmetic	260	136	Paid
Reading—two Classes	82	64	"
Do. and Elocution	18	12	Grat.
Grammar, Elementary	77	30	Paid
Grammar, Advanced Class ...	40	17	"
English Language & Literature	10	7	"
Geography	30	14	Grat.
English History	18	12	"
Mathematics	18	10	Paid
Book-keeping	19	15	"
Chemistry	16	13	Grat.
Natural Philosophy	11	8	
French	30	25	Paid
German	6	6	"
Drawing and Modelling.........	33	24	"
	668	393	

The prize of £8 offered by the Society of Arts to the Local Board whose candidates obtaining certificates bear the largest proportion to the whole number of candidates, was awarded to the Local Board of this Institution last year; and it was the only one in Yorkshire which succeeded in obtaining a prize. The Local Board decided to divide five guineas of this prize among all the candidates (except two who received other prizes) in the proportion of seven shillings and sixpence to each first-class certificate, five shillings to each second-class certificate, and two shillings and sixpence to each third-class certificate. The Committee have much pleasure in recording for the second time the generosity of Alfred Harris, jun., Esq., who has shown his interest in the Institute and in these Examinations by placing £5 at the disposal of the Local Board, to be awarded as prizes to the candidates who obtained highest honours. The prizes were awarded as follows:—First prize of £3 to John G. Greenhough; second prize of £2 to Joseph S. Roberts. In conclusion, the Committee feel that they are warranted by the foregoing reports in inferring that the Institute is at present in a sound and healthy condition, and is steadily accomplishing the great object for which it was designed—the diffusion of useful knowledge amongst their fellow-townsmen. At the same time they are fully aware that, so long as its operations are confined within its present narrow limits, it cannot very greatly extend its labours, or increase its usefulness. And they therefore earnestly hope that, with a revival of trade and returning prosperity, their successors will take up the project of a new building with increased energy, and carry it forward to a successful issue.

POTTERIES MECHANICS' INSTITUTE, HANLEY, STAFFORDSHIRE POTTERIES.—The formal opening of a large and elegant building, recently erected for the purposes of this Institution, was celebrated by a public *soirée*, on Tuesday, 15th October. The chair was occupied by WILLIAM BROWNFIELD, Esq., one of the Vice-Presidents, and addresses were delivered by the Right Hon. C. B. Adderley, M.P.; the Rev. Sir Lovelace T. Stamer, Bart.; Smith Child, Esq. (late M.P. for North Staffordshire); James Bateman, Esq., R.R.S.; J. A. Hammesley, Esq., F.S.A., and other gentlemen. Besides a residence for a curator, the building contains fourteen rooms, comprising a lecture and music hall (capable of accommodating 800 persons), a large reading-room, a spacious library, class, committee, and other rooms. A report, presented by the Building Committee, stated the cost of the structure and fittings to be about £5,000, and the present deficiency about £1,100. One of the principal features is the extensive reading-room, calculated to seat about 120 persons, to erect and furnish which Mr. Brownfield (the chairman of the meeting) contributed £650. This room is supplied with 38 copies of daily, and 30 of weekly newspapers, besides 30 reviews and magazines, the subscription being one shilling per quarter.

To Correspondents.

ERRATUM.—In the last number of the *Journal*, page 791, first column, line 19, for " (who was Secretary to the Royal Society)" read, "(who became subsequently a Member and Foreign Secretary of the Royal Society)."

MEETINGS FOR THE ENSUING WEEK.

MON. ...Medical, 8½. General Meeting, and Paper by Mr. Thomas Bryant, " Remarks on Vesico-Vaginal Fistula and Ruptured Perineum, with the introduction of improved means for operating."

WED. ...Geological, 8. 1. M. Marcel de Serres, " Note on the Bone Caves of Lunel Viel, Herault." 2. Dr. A. Gesner, " On the Petroleum Springs of North America." 3. Mr. J. G. M. Seitch, " On a Volcanic Phenomenon in Manilla." 4. Dr. J. W. Dawson, F.G.S., " On some Additional Remains of Land Animals in the Coal Measures of Nova Scotia."
Pharmaceutical, 8.

THURS...Chemical, 8. 1. Mr. A. V. Harcourt, " On the Action of certain Gases on the Alkaline Peroxides." 2. Messrs. Abel and Field, " On some Results of the Analysis of Commercial Coppers." 4. Mr. Field, " On the Occurrence of Bismuth in Copper Minerals."
Linnæan, 8. 1. Dr. Lindley, " On West African Tropical Orchids." 2. Prof. Oliver, " On the Structure of the Anther."

FRI..... ..Astronomical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, October 25th*, 1861.]

Dated 15th July, 1861.

1773. T. Cobley, Meerholz, Germany—An improved process for preserving and indurating timber, wood, and other vegetable matters, and for rendering the same uninflammable.

Dated 15th August, 1861.

2035. J. T. Hutchings, Charlton, Kent—An imp. in the construction of tennis and racket bats.

Dated 19th August, 1861.

2057. E. S. Cathels, Shrewsbury—Imp. in compensating gas meters.

Dated 21st August, 1861.

2087. A. J. Hennart, Tournay, Belgium—Imp. in smoke consuming grates.

Dated 23rd August, 1861.

2105. M. Blakey, Leeds—Imp. in rotary pumps.

Dated 7th September, 1861.

2244. G. H. Birkbeck, 34, Southampton-buildings, Chancery-lane—Imp. in the construction of saddles. (A com.)

Dated 13th September, 1861.

2275. P. Dubrule, Tourcoing, France—Imp. in apparatus for manufacturing figured or ornamental stuffs with treadle power looms.

Dated 16th September, 1861.

2309. Captain A. M. Skinner, Belfast—Imp. in propelling ships' boats and other vessels. (A com.)

2312. F. M. Ransome and E. L. Ransome, Ipswich—Imp. in treating stone, bricks, and other surfaces, and in the manufacture of filters.

Dated 19th September, 1861.

2335. J. C. Coombe and J. Wright, 42, Bridge-street, Blackfriars—Imp. in the manufacture of stones, bricks, tiles, slabs, statuary, and such like materials, and in the method of and means for cleansing and indurating the same when employed in buildings or for building purposes, and for preserving them from atmospheric and other influences.

2338. E. Clark, Chatham-street, Liverpool—Improved means or apparatus for self-acting signals in tunnels and elsewhere on railways.

2343. T. Silver, Philadelphia, U.S., and T. Moore, 33, Regent-circus, Piccadilly—Imp. in the construction of and appliances to steam ships or other vessels.

2348. T. Redwood, 19, Montague-street, Russell-square—An imp. in the manufacture of paper.

Dated 21st September, 1861.

2367. W. Tongue, Bradford—Imp. in machinery for combing, heckling, and dressing fibrous materials.

Dated 27th September, 1861.

2419. J. Waller, Anerly, Surrey—An improved smoke-consuming stove.

Dated 2nd October, 1861.

2452. D. Rérolle, 4, South-street, Finsbury—An improved steam digging machine.

2459. W. Thompson and T. Stather, Kingston-upon-Hull—Imp. in hydraulic presses.

Dated 4th October, 1861.

2478. A. David, jun., Nantua, France—Imp. in preparing and fixing street and other inscriptions or lettering on metallic plates.

2480. G. Knox, Skinner's place—An imp. in paper-making machines.

2484. J. Dellagana, Shoe-lane—Imp. in finishing and perfecting curved or circular stereotype plates, and in apparatus for the same.

Dated 5th October, 1861.

2489. E. Partridge, Smethwick, Staffordshire—Imp. in hardening iron and steel, and a composition or substance to be employed therein.

2494. Lieutenant G. Nares, R.N., Portsmouth—An improved method of effecting communication between places, otherwise inaccessible to each other, by means of kites and an apparatus connected therewith.

Dated 7th October, 1861.

2498. B. P. Walker, Wolverhampton—Imp. in rifle sights and rifle sight guards, and a new or improved rifle cleaner.

2500. W. Callcott, Park-village East, Middlesex—Improved means and apparatus for producing scenic effects.

2502. G. K. Stothert, Bristol—Imp. in condensing apparatus.

2504. F. J. Evans, Horseferry-road, Westminster—Improved apparatus for generating gas.

Dated 8th October, 1861.

2510. W. Simpson, Calais—Imp. in the manufacture of twist lace made in twist lace machines.

Dated 9th October, 1861.

2519. J. Norman, Glasgow—Imp. in hammers to be worked by steam or other elastic fluid and in anvils for the same.

2521. H. B. Coathupe, Junior United Service Club, St. James's, and F. H. Waltham, 15, Palace-street, Haverstock-hill—Imp. in obtaining or producing and applying embossed or raised and engraved or indented metal or other surfaces.

2522. F. Curtis, Newton, Middlesex—A new and useful imp. in fire-arms.

2523. W. Palmer, Sutton-street, Clerkenwell—Imp. in lamps and lamp wicks.

2524. J. J. Russell, Wednesbury—Imp. in hand stocks and dies for cutting screws.

2525. T. Tidmarsh, Dorking, Surrey—An improved artificial manure.

2526. J. Schwartz, Osborne-street, Whitechapel—An imp. in the manufacture of sugar.

Dated 10th October, 1861.

2528. T. B. Bennett, and J. Collier, Gilnow Mills, near Bolton-le-Moors—Certain imp. in or applicable to self-acting mules for spinning.

2529. D. S. Brown, Eton-lodge, Ashby-road, Islington—Certain imp. in propelling and sustaining balloons and aerial machines in the air.

2530. W. Mould and J. Hall, Belmont, near Bolton, and S. Cook and W. H. Hacking, Bury—Imp. in machinery for manufacturing healds or harness used in looms for weaving.

2532. J. Stevens, Birmingham—Certain imp. in connectors and adjusters for connecting and adjusting crinolines.

2533. L. Christoph, Paris, W. Hawksworth, Linlithgow, N.B., and G. P. Harding, Paris—Imp. in the manufacture of cast steel and other metal tubes, and in the machinery or apparatus employed therein, parts of which imp. are applicable to the manufacture of gun barrels and ordnance, and to the rifling of same.

2534. B. Browne, 52, King William-street—A new improved spring. (A com.)

2538. W. Clark, 53, Chancery-lane—Imp. in apparatus for bending iron rails or bars. (A com.)

Dated 11th October, 1861.

2541. R. Richardson, 26, Great George-street, Westminster—Imp. in the manufacture of railway fastenings, and a mode of preparing rails and fish plates to receive them.

2542. T. B. Collingwood and A. Butterworth, Rochdale—Imp. in throstle and doubling frames for spinning and doubling fibrous materials.

2543. W. E. Newton, 66, Chancery-lane—Imp. in the condensers and condensing apparatus of steam engines. (A com.)

2544. N. Stram, 12, Ashby-street, Northampton-square—Imp. in watches.

Dated 12th October, 1861.

2546. E. Corke, Southborough, Tunbridge Wells, Kent—An improved instrument to be attached to the bayonet or barrel of a rifle or other fire-arm for estimating distances.

2547. R. Edge, Dean Mills, near Bolton-le-Moors—Certain imp. in machinery for preparing, spinning, and doubling cotton and other fibrous materials.

2549. J. C. Ramsden, Bradford—Imp. in healds or headles for weaving, and in the machinery or apparatus for making the same.

2550. V. Pirson and A. De Keyser, Brussels—The application of a new material in the manufacture of paper cardboard and yarns.

2551. E. T. Hughes, 123, Chancery-lane—An improved compound to prevent the incrustation and sediments of calcareous matters in boilers. (A com).

2554. M. Cartwright, Carlisle—Imp. in stench traps.

2555. A. V. Newton, 66, Chancery-lane—Improved machinery for dressing and cleaning wheat and other grain. (A com.)

Dated 14th October, 1861.

2558. W. Macnab, Greenock—Imp. in marine steam engines and boilers.

2559. H. J. Distin, 9, Great Newport-street, Leicester-square—Imp. in metal musical wind instruments.

2560. J. Browning, Minories—Imp. in barometers.

2562. F. B. Houghton, 6, Clarendon-terrace, Kensington—Imp. in apparatus employed in reducing straw and other vegetable substances in the manufacture of pulp for making paper.

2563. M. Walker, St. Benet's place, Gracechurch-street—Imp. in breech-loading rifles.

Dated 15th October, 1861.

2564. J. Flinn, sen., Coventry—An imp. in watches.

2565. C. Wynants, Belgium—An improved chase for printing presses.

2566. W. Bland, Baildon, near Leeds—Imp. in pickers used in looms for weaving.

PATENTS SEALED.

[*From Gazette, October 25th*, 1861.]

October 24th.

1029. G. Scott.
1031. D. Barker.
1036. P. G. Gardiner.
1037. T. Garner.
1041. J. S. Templeton.
1045. S. C. Salisbury & J. Starley.
1047. C. J. Hill.
1018. R. J. Cole.
1055. J. Marshall.
1059. S. C. Salisbury & J. Starley.
1060. J. Poole and W. Milward.
1061. J. Foster, E. H. Bramley, and E. Knutton.
1064. T. W. Miller.
1066. W. H. Farsons.
1069. H. Bessemer.
1075. W. Johnson.
1078. G. Hulme.
1080. T. A. Kendal and M. D. Rogers.
1081. W. Horn.
1083. J. Sickels.
1084. R. Laing and I. Swindells.
1085. F. J. Bramwell & W. Owen.
1089. T. Hooman and J. Maliszewski.
1091. A. McNeile.
1102. L. Glatard.
1109. M. A. F. Mennons.
1115. J. A. Manning.
1120. W. Addy.
1187. A. Dunlop.
1216. A. C. Vautier.
1257. T. Dunn.
1258. T. Dunn.
1498. W. E. Newton.
1701. W. H. Ludford.
1879. J. H. Johnson.
1955. A. A. R. Damoiseau.
2080. C. A. Wheeler.
2119. M. A. F. Mennons.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, October 25th*, 1861.]

October 21st.

2363. R. Waller.

October 22nd.

2377. F. Fowke.
2387. B. Goodfellow.

[*From Gazette, October 29th*, 1861.]

October 24th.

2378. J. Robb.
2538. T. F. Cocker.

October 25th.

2411. W. Hall and A. Wells.
2412. P. Brunon.

October 26th.

2406. A. Heywood.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[*From Gazette, October 25th*, 1861.]

October 22nd.

2266. J. Hopkinson, jun.
2275. C. Mather.